**Template | Unit Enhancement**

***ENGINEERING DESIGN***

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**Background Information**

**Instructional Materials Title:** Sound

**Publication Date:** 1997

**Work Group Participants:** Cathy Alward, Dan Barkley, Chris Paul, Martha May, Anela Deisler

**Date Developed:** 8/22/13

**High Leverage Lesson (Title and Page Number):** Lesson 7 - designing a reed instrument
Rationale

**Rationale**

· **Why we identified this particular lesson:** It has an opportunity for authentic instrument design built-in.

**- Connections to NGSS and WA Science Standards** 4-5 PS3D Sound energy can be genereated by making things vibrate.

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***Engineering* Lesson Enhancement**

**Overview**

· **Identification of where within the High Leverage Lesson to insert enhancement:**

· **Key instructional strategies and tools needed**

**Part 1: Lesson Modifications to Lead Up to *Engineering Task***

After students successfully make a basic reed with a single straw, move on to this engineering task. Do not give additional materials and do not show instructions from pages 63-65 in teachers guide. We suggest teaching the lesson enhancement for Lesson 6 to build engineering background knowledge and experiences.

**Part 2: *Engineering* Learning Sequence**

1. Define the problem.
   1. Students define their problem and fills in worksheet. Ex: *my instrument only plays one pitch* or *my instrument is quiet*.
   2. Teacher gives criteria: design reed instrument
   3. Students create criteria and fill in worksheet: such as *must make low pitch*, *is louder*, *can make different/more pitches*, etc.
   4. Teacher gives constraints: materials: consumables such as extra straws, paper, tape and can use normal classroom tools such as scissors and hole punch, give students appropriate amount of time, suggestion: 10-20 minutes.
2. Designing Solutions.
   1. Students draw and explain 2 or more models of solutions to their problem
   2. Students choose at least 2 models and create their design.
3. Optimize Solutions
   1. Students test and rate their designs based on their criteria. (ex: 4/5 stars, or ☺ vs ☹)
   2. Students collaborate by sharing their solutions with small groups organized by similar criteria. They write what they learned from a partner.
   3. Students may use pages 63-65, 54-55 (in teacher’s guide), instrument books, or images of instruments as research.
   4. Students draw and explain another model to optimize their original designs.
   5. Students create or modify their instrument.
   6. Students reflect on their design and write an explanation of their solution.
   7. Teacher guides groups of students with similar criteria to share designs.

**Part 3-B: Assessment Rubric**

|  |  |  |
| --- | --- | --- |
| **Yes** | **Needs support** | **Criteria** |
|  |  | States a problem. Precisely specify criteria of successful solutions. |
|  |  | Brainstorm/explore multiple solutions. |
|  |  | Collaborate and research to generate new ideas for solutions. |
|  |  | Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success |
|  |  | Revise solutions |
|  |  | Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem |

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**Additional Information**

NOTES

· Information that will be useful when teaching this lesson

- Resources that will be useful

- Scaffolds that students will use

**Engineering: Make a Reed Instrument**

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| --- | --- | --- |
| **Problem** | **Constraints** | **Criteria** |
|  | 1. Use available materials.  2. \_\_\_\_\_\_ minutes |  |

1. Design and sketch 2 possible models for your solution. Explain how each will solve your problem. If you need more space go to the next page of your journal.

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rating \_\_\_\_\_\_\_\_ rating \_\_\_\_\_\_\_\_

2. What did you learn from a peer about your design?

1. How can you **optimize** (make it better)? Draw and explain your new and improved design.

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| --- |
|  |

1. How does your design meet the criteria?